Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Diabetes short term complications admission: percentage of admissions for a principal diagnosis of diabetes with short-term complications per 100,000 population, ages 18 years and older.

Source(s)

AHRQ QI research version 5.0. Prevention quality indicator 1 technical specifications: diabetes short-term complications admission rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

National Quality Forum measure information: diabetes short-term complications admission rate (PQI 01). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

Measure Domain

Primary Measure Domain

Related Population Health Measures: Population Use of Services

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of admissions for a principal diagnosis of diabetes with short-term complications (ketoacidosis, hyperosmolarity, or coma) per 100,000 population, ages 18 years and older.

Rationale

Common short-term complications of diabetes mellitus (diabetes) include diabetic ketoacidosis (DKA), hyperosmolarity (also known as hyperglycemic hyperosmolar nonketonic syndrome [HHNS]), and coma. These life-threatening events are due to excess glucose (DKA and hyperosmolarity) or insulin (coma) as

result of poor glycemic control. Precipitating events leading to hospital admission for diabetic complications may include physiologic causes, the cessation of treatment, lack of access to care, or other adherence issues. Hospitalizations related to short complications of diabetes may be avoided by better disease management and improved diabetic screening.

The cornerstone of diabetic disease management, and thus the prevention of short-term complications of diabetes, is glycemic control. Despite medical advances and increased awareness of diabetes in both the lay and medical communities, few patients with diabetes broadly achieve targets for glucose management and other preventative care interventions, as outlined in nationally accepted clinical guidelines (American Diabetes Association, 2013; Riethof et al., 2012; University of Michigan Health System, 2012; Department of Veteran Affairs & Department of Defense, 2010). Better glycemic control can be achieved through: higher access to medical care in the ambulatory setting; appropriate medication and home glucose monitoring; better care coordination among providers; proper nutrition; patient education and improved self-management (including sick day management and early symptom activation); and treatment or co-management of comorbid mental illness. Preventing hospitalization for complications associated with de novo cases can be achieved through better diabetic screening programs and earlier treatment of disease. The U.S. Preventive Services Task Force (2008), the Agency for Healthcare Research and Quality (AHRQ) has outlined additional research to examine the effectiveness of screening for Type 2 diabetes mellitus, impaired fasting glucose and impaired glucose tolerance.

These clinical practice guidelines suggest that short-term complications are preventable and, thus, hospitalizations for these short-term complications are preventable.

This measure is an avoidable hospitalization/ambulatory care sensitive condition (ACSC) type indicator. ACSC type indicators are not measures of hospital quality, but rather measures of potentially avoidable hospitalization if appropriate outpatient care, other healthcare services or community services were accessed and obtained (i.e., measures of the health care system broadly defined). These measures are designed to assess population access to timely, high quality outpatient and public health services in a particular geographic area, for the purpose of managing chronic disease or diagnosing acute illnesses before progressing to inpatient treatment. These measures are of most interest to comprehensive health care delivery systems, such as some health maintenance organizations (HMOs), accountable care organizations (ACOs) or public health agencies. ACSC indicators correlate with each other and they may be used in conjunction as an overall examination of outpatient care and access to care at a national, regional or county level.

Evidence for Rationale

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American Diabetes Association. Standards of medical care in diabetes--2014. Diabetes Care. 2014 Jan;37 Suppl 1:S14-80. PubMed

Department of Veteran Affairs, Department of Defense. VA/DoD clinical practice guideline for the management of diabetes mellitus. Washington (DC): Department of Veteran Affairs, Department of Defense; 2010 Aug. 146 p.

National Quality Forum measure information: diabetes short-term complications admission rate (PQI 01). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

Riethof M, Flavin PL, Lindvall B, Michels R, O'Connor P, Redmon P, Retzer K, Roberts J, Smith S, Sperl-Hillen J, Institute for Clinical Systems Improvement (ICSI). Diagnosis and management of type 2 diabetes mellitus in adults. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2012 Apr. 141 p. [198 references]

Robbins JM, Thatcher GE, Webb DA, Valdmanis VG. Nutritionist visits, diabetes classes, and hospitalization rates and charges: the Urban Diabetes Study. Diabetes Care. 2008 Apr;31(4):655-60. PubMed

U.S. Preventive Services Task Force (USPSTF). Final update summary: diabetes mellitus (type 2) in adults: screening. [internet]. Rockville (MD): U.S. Preventive Services Task Force (USPSTF); 2008 Jun.

University of Michigan Health System. Management of type 2 diabetes mellitus. Ann Arbor (MI): University of Michigan Health System; 2012 Sep. 27 p. [17 references]

Primary Health Components

Diabetes; short-term complications; ketoacidosis; hyperosmolarity; coma; ambulatory care sensitive condition (ACSC)

Denominator Description

Population ages 18 years and older in the metropolitan area or county (see the related "Denominator Inclusions/Exclusions" field)

Numerator Description

Discharges, for patients ages 18 years and older, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for diabetes short-term complications (ketoacidosis, hyperosmolarity, or coma) (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A systematic review of the clinical research literature (e.g., Cochrane Review)

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Hospitalization rates for complications associated with diabetes vary substantially by race. Socioeconomic factors account for some but not all of these disparities (Kim et al., 2010; Shen & Washington, 2008). Disadvantaged patients are more likely to be admitted for acute complications of their diabetes (which are more easily preventable), as opposed to chronic complications (Jiang et al., 2005) and to be admitted through the emergency department (ED) (Kim et al., 2010; Shen & Washington, 2008). Once admitted, minorities have been shown to have longer average lengths of stays and incur higher costs. Blacks and Hispanics have been shown to less likely have coverage of Part B services (physician services) compared to whites, and Medicare patients without private insurance coverage of Part B services were less likely to self-monitor their blood glucose, have regular checkups, or receive treatment for hypertension or dyslipidemia (Harris, 1999). Persons with intellectual disabilities and mental health disorders have been shown to have an increased risk for hospitalization for diabetic related complications (Becker & Hux, 2011; Druss et al., 2012); however, not all studies are consistent (Leung et al., 2011).

Among minority patients admitted with diabetic ketoacidosis (DKA), Hispanic patients were particularly likely to be readmitted (58% versus 27% of African Americans). Lower family income, younger age at diagnoses, recreational drug abuse, behavioral problems, insurance type, elevated hemoglobin A1c and being from a family with less than a high school education have increased odds ratios to present with DKA at diagnosis when first diagnosed, as well recurrent admissions (Van Ness-Otunnu & Hack, 2013; Rewers et al., 2008; Lopez-de-Andres et al., 2010; Dungan, 2012). One study targeting DKA hospitalizations found females, aged 15 to 34, had an adjusted rate ratio of 15.21 compared to those over 65 (Liu et al., 2010), while another reported a potential benefit by introducing earlier insulin therapy to women with poorly controlled type 2 diabetes mellitus receiving oral hypoglycemic therapy (Cook et al., 2007). Older adults admitted with diabetic complications are more likely to have more comorbid condition and more insidious presentation. Approximately 40% of older patients presenting with severe hyperglycemia do not have a known history of diabetes.

In addition, other socioeconomic status (SES) factors related to disparities in avoidable hospitalization rates have been reported. Avoidable hospitalization rates for diabetes were inversely related to income level in a population-based cohort of persons with diabetes studied between 1992 and 1999 in Canada. Individuals in the lowest income quintile were 44 percent more likely to have an event than those in the highest quintile (16.4 percent vs. 11.4 percent, p less than 0.001). The gradient was most marked in 45- to 64-year-olds (OR = 1.76; 95 percent confidence interval [CI], 1.69-1.82). The relationship between SES and hospitalization rates persisted after adjusting for age, sex, urban vs. rural residence, comorbidity, frequency of physician visits, continuity of care, physician specialty, and geographic region (Booth & Hux, 2003). Billings et al. (1993) found that low-income zip codes in New York City (where at least 60 percent of households earned less than $15,000 in 1988, based on adjusted 1980 Census data) had 6.3 times more acute diabetes hospitalizations per capita than high-income zip codes (where less than 17.5 percent of households earned less than $15,000). This disparity by income persisted across all age groups, including those over 65.

Short term complications for diabetes (DKA, hyperosmolarity, and coma) are the leading cause of hospitalization related to diabetes and are responsible for the majority of costs associated with diabetes care. This is considerable as United States (U.S.) healthcare costs in 2007 related to diabetes were $174 billion (American Diabetes Association, 2008). These costs continue to increase with the growing diabetic epidemic. Other cost estimates report that one out of every four health care dollars spent is on direct medical care for adult patients with type 1 diabetes and for one of every two dollars in patients experiencing multiple episodes of DKA (Javor et al., 1997). Estimates show that by 2030, 55.5 million Americans aged 18 to 79 years of age will have diabetes and that by 2050 this number will increase to 86.6 million, representing one in every three adults (Boyle et al., 2010). A study using Healthcare Cost and Utilization Project (HCUP) data reported that the combination of uncontrolled diabetes (Prevention Quality Indicator [PQI] #14) and short-term diabetes complications (PQI #1) accounted for 36% of all diabetic related hospitalizations in 2004 at a cost of 1.3 billion dollars (Ahern & Hendryx, 2007). Besides hospitalizations, acute diabetic complications are the seventh leading cause of death in the U.S. (2007) and are considerable source morbidity.

Decreased short-term complication rates have been reported for patients whose diabetes is managed in primary care networks compared to non-network managed patients (Menzin et al. 2010), those with continuity of care with a usual healthcare provider (Lin et al., 2010), those routinely cared for by an endocrinologist compared to those with no access or inconsistent care by an endocrinologist (Liu et al., 2011), those enrolled in a publicly-funded safety-net health clinics (Robbins, Valdmanis, & Webb, 2008), and for those cared for over time by a preferred provider organization with pay-for-performance incentives (Chen et al., 2010). Innovative types of outpatient case management programs shown to effective in decreasing diabetic hospitalizations for short complications include: cluster or group visits (Ward, 2009; Steinsbekk et al., 2012), mobile phone support for young adults (Farrell & Holmes-Walker, 2011), Care Coordination Home Telehealth for Veterans (Jia et al., 2009), and any all types of enhanced patient education (Steinsbekk et al., 2012; Robbins et al., 2008; Worswick et al., 2013).

Evidence for Additional Information Supporting Need for the Measure

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National Quality Forum measure information: diabetes short-term complications admission rate (PQI 01). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

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Extent of Measure Testing

Reliability Testing
The developer's metric of reliability is the signal to noise ratio, which is the ratio of the between county (area) variance (signal) to the within area variance (noise). The formula is signal/(signal + noise). There is an area-specific signal to noise ratio, which is used as an empirical Bayes univariate shrinkage estimator. The overall signal to noise ratio is a weighted average of the county (area)-specific signal-to-noise ratio, where the weight is [1/(signal + noise)^2]. The signal is calculated using an iterative method. The analysis reports the reliability of the risk-adjusted rate (before applying the empirical Bayes univirate shrinkage estimator).

Overall the risk-adjusted rate is highly reliable. Based on a norm of a signal-to-noise ratio of 0.80, 80% of counties (areas) exceed the norm. Reliability is less than the norm in counties (areas) with population less than approximately 6,000 persons, meaning that the performance score is reliability adjusted closer to the shrinkage target in those counties (areas).

Validity Testing
The developer conducted construct validity testing to examine the association between the risk-adjusted rate and area structural characteristics potentially associated with quality of care, including prior performance, using regression analysis.

Given the stated rationale, the expectation for the regression analysis given the expected relationship between the "Less Access to High Quality Outpatient Care" construct validity measure and the county (area) risk-adjusted rate is a positive, statistically significant coefficient. The expectation for the regression analysis given the expected relationship between the "More Market Competition" construct validity measure and the county (area) risk-adjusted rate is a positive, statistically significant coefficient. The results are consistent with expectations. Also, past performance is a strong predictor of current performance with a coefficient of 0.91.

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

National Quality Forum measure information: diabetes short-term complications admission rate (PQI 01). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Regional, County or City

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

National Framework for Public Health Quality

Public Health Aims for Quality

Population-centered

Risk Reducing

Vigilant

National Strategy for Quality Improvement in Health Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

The time period is one year.

Note: The reference population rates and signal variance parameters assume a one-year time period.

Denominator Sampling Frame

Geographically defined

Denominator (Index) Event or Characteristic

Geographic Location

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Population ages 18 years and older in the metropolitan area or county. Discharges in the numerator are assigned to the denominator based on the metropolitan area or county of the patient residence, not the metropolitan area or county of the hospital where the discharge occurred.

Note:

> May be combined with uncontrolled diabetes as a single indicator as a simple sum of the rates to form the *Healthy People 2010* indicator (note that the AHRQ QI™ excludes transfers to avoid double-counting cases).
> The term "metropolitan area" (MA) was adopted by the United States (U.S.) Census in 1990 and referred collectively to metropolitan statistical areas (MSAs), consolidated metropolitan statistical areas (CMSAs), and primary metropolitan statistical areas (PMSAs). In addition, "area" could refer to either 1) Federal Information Processing Standard (FIPS) county, 2) modified FIPS county, 3) 1999 Office of Management and Budget (OMB) Metropolitan Statistical Area, or 4) 2003 OMB Metropolitan Statistical Area. Micropolitan Statistical Areas are not used in the Quality Indicator (QI) software.
> The denominator can be specified with the diabetic population only and calculated with the SAS QI software through the condition-specific denominator at the state-level feature.

Exclusions
Unspecified

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions

Discharges, for patients ages 18 years and older, with a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code for diabetes short-term complications (ketoacidosis, hyperosmolarity, or coma)

Note:

> By definition, discharges with a principal diagnosis of diabetes with long-term complications are precluded from an assignment of Major Diagnostic Categories (MDC) 14 by grouper software. Thus, obstetric discharges should not be considered in the Prevention Quality Indicator (PQI) rate, though the AHRQ QITM software does not explicitly exclude obstetric cases.
> Refer to the original measure documentation for ICD-9-CM codes. See also the *Prevention Quality Indicators Appendices*.

Exclusions

Exclude cases:

- Transfer from a hospital (different facility)
- Transfer from a Skilled Nursing Facility (SNF) or Intermediate Care Facility (ICF)
- Transfer from another health care facility
- With missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), principal diagnosis (DX1=missing), or county (PSTCO=missing)

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Proxy for Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Does not apply to this measure (i.e., there is no pre-defined preference for the measure score)

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with area random effect) and covariates for gender and age (in 5-year age groups). The reference population used in the regression is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for the year 2010 (combined), a database consisting of 46 states and approximately 38 million adult discharges, and the United States (U.S.) Census data by county. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., area). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate.

Refer to the original measure documentation for the specific covariates for this measure.

Standard of Comparison

not defined yet

Identifying Information

Original Title

PQI 1: diabetes short-term complications admission rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Prevention Quality Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2014 Sep 18

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates previous versions:

> AHRQ QI. Prevention quality indicators #1: technical specifications. Diabetes short-term complications admission rate [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 2 p.

AHRQ quality indicators. Prevention quality indicators: technical specifications [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 6 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site.

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Prevention quality indicators (PQI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 21 p. This document is available from the AHRQ Quality Indicators Web site.

AHRQ quality indicators. Prevention quality indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 9 p. This document is available from the AHRQ Quality Indicators Web site.

AHRQ quality indicators. Prevention quality indicators (PQI) composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Apr 7. various p. This document is available from the AHRQ Quality Indicators Web site.

HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site.

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: (301) 427-1949.

NQMC Status

This NQMC summary was completed by ECRI on December 19, 2002. The information was verified by the Agency for Healthcare Research and Quality on January 9, 2003.

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Copyright Statement

Production

Source(s)

Source(s)

AHRQ QI research version 5.0. Prevention quality indicator 1 technical specifications: diabetes short-term complications admission rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

National Quality Forum measure information: diabetes short-term complications admission rate (PQI 01). Washington (DC): National Quality Forum (NQF); 2014 Sep 18. 18 p.

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